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Nonablative Treatment of Rhytids With Intense Pulsed Light

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Background and Objective: **The aim of this study was to evaluate the efficacy and complication rate of a nonablative nonlaser light source in the treatment of rhytids. Laser resurfacing, in the treatment of facial rhytids, has involved ablative methods, with their associated complications and limitations. Rhytid improvement requires dermal collagen remodeling. Interest has begun to focus on the use of wavelengths that preserve the epidermis but deliver enough energy to promote rhytid improvement.**
Study Design/Materials and Methods: **Thirty subjects with class I–II rhytids and Fitzpatrick skin types I–II were treated with up to four treatments with an intense pulsed light source. Subjects were evaluated 6 months after the final treatment.**
Results: **Twenty-five subjects showed some improvement in the quality of skin. No subjects were found to have total resolution of rhytids.**
Conclusion: **Nonlaser intense pulsed light may effectively improve some facial rhytids. Such improvement can occur without epidermal ablation. Lasers Surg. Med. 26:196–200, 2000.** **© 2000 Wiley-Liss, Inc.**

Key words: laser resurfacing; non-ablation; intense pulsed light

INTRODUCTION

The treatment of facial rhytids has traditionally centered around methods that destroy the epidermis and cause a dermal wound, with resultant dermal collagen remodeling [1]. These methods have included dermabrasion, chemical peels, and, more recently, the use of the char-free pulsed CO_2 and Er:YAG lasers [2]. Currently available ablative lasers lead to some degree of dermal damage, with resultant changes in dermal collagen. Such lasers commonly lead to postoperative complications such as oozing, bleeding, infections, and “downtime” as the skin begins to reepithelialize [1,3–5]. Another common complication from ablative systems is the occasional incidence of undesirable postinflammatory pigmentary changes [5,6].

Intense pulsed light sources are flashlamp devices that emit wavelengths of light between 550 and 1,100 nm. Such a device has documented efficacy in the treatment of vascular lesions, with several filter options that can block all shorter wavelengths from entering the skin. With the use of appropriate filters, longer wavelengths are emitted from the intense pulsed light source. Such longer wavelengths may cause nonspecific dermal damage. This study evaluated the efficacy of a nonablative pulsed light source in the improvement of facial rhytids.

MATERIALS AND METHODS

Thirty female subjects, aged 35–65 years, with class I–II facial rhytids (periorobital, perioral, and forehead) and Fitzpatrick skin types I–II were entered into the study. Subjects were excluded if they had used oral retinoids within 1 year before the study or had a history of photosensitivity or inflammatory skin disease. All subjects were treated one to four times, at 2-week intervals, over a 10-week period, with an intense pulsed light source (ESC Medical, Yokneam, Is-

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Fig. 1. Perioral rhytids before treatment with intense pulsed light.

Fig. 2. Erythema seen immediately after treatment with intense pulsed light.

rael) using a 645-nm cutoff filter. Most subjects were treated three to four times. Energies varied between 40 and 50 J/cm^2, with delivered triple 7-msec pulses and a 50-msec interpulse delay. Energy was delivered through an 8- × 33-mm light guide that was precooled with a bracketed cooling collar to 4°C. No pretreatment was provided. The 645-nm cutoff filter was chosen to block shorter wavelengths that only superficially penetrate the dermis. Postoperatively, bacitracin ointment was applied to the treated areas. The number of treatment sessions was chosen randomly.

Fig. 3. Periorbital rhytids before treatment with intense pulsed light.

Fig. 4. Improvement in rhytids noted 6 months after treatment with intense pulsed light.

All subjects were evaluated by two independent nontreating observers for degree of improvement 6 months after the last treatment and for immediate and delayed complications. Evaluations were made from photographs. All pictures were taken under identical conditions and camera settings. Improvement was evaluated by the following criteria: (a) no improvement, (b) some improvement, (c) substantial improvement, and (d) total improvement. Evaluated complications included erythema, blistering, pigmentary changes, and scarring.

Fig. 5. Forhead rhytids before treatment with intense pulsed light.

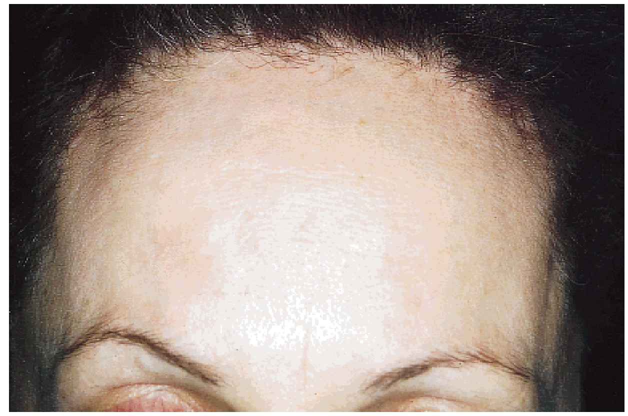

Fig. 6. Improvement in rhytids noted 6 months after treatment with intense pulsed light.

RESULTS

Six months after the final treatment, five subjects showed no apparent clinical improvement, 16 subjects showed some improvement, and nine subjects showed substantial improvement. No subjects showed total improvement (Figs. 1–6). Immediately after at least one treatment, all 30 subjects showed some erythema. Three subjects had blistering after at least one session. Six months after the final treatment, no erythema, pigmentary changes, or scarring was noted in any of the treated individuals.

DISCUSSION

In one of the first studies evaluating a nonablative approach to dermal remodeling, a 1,064-nm Q-switched Nd:YAG laser was used to improve rhytids [7]. Eleven subjects with perioral or periorbital rhytids were evaluated by using a Q-switched Nd:YAG laser at 5.5 J/cm^2 and a 3-mm spot size. All subjects were of skin phenotypes I and II; all had class I or II rhytids. The authors sought a nonspecific clinical endpoint of pinpoint bleeding. Subjects were evaluated 90 days after treatment. In three patients, the authors noted improvement that was thought to be comparable to that following ablative resurfacing. In six patients, clinical improvement was noted but was not thought to be as significant as that seen with an ablative laser system. In two patients, no clinical improvement was noted. At 1 month, three of 11 subjects showed persistent erythema at the treated sites. At 3 months, all erythema was resolved.

That study was expanded when the nonablative dermal remodeling effects of a Q-switched Nd:YAG laser was potentiated by the use of a topical carbon-assisted solution [3]. In that study, 242 sites on 61 human subjects were treated with three 1,064-nm Q-switched Nd:YAG laser treatments. Parameters of treatment included a fluence of 2.5 J/cm^2, pulse duration of 6–20 nsec, and a spot size of 7 mm. The treatment sites were evaluated 32 weeks after treatment for skin texture, skin elasticity, and rhytid reduction. In the study, a low-fluence Q-switched Nd:YAG laser was used. Unlike the previous study, there was no epidermal disruption when the lower fluences were used. The Q-switched Nd:YAG laser energy is not well absorbed by tissue water; it is nonselectively placed within the dermis. The 1,064-nm wavelength results in relatively deep penetration into the skin, which is indicative of minimal laser–tissue interaction. At 8 months, the investigators reported improvement in skin texture and skin elasticity and rhytid reduction. The majority of adverse events were limited to mild, brief erythema.

Other nonablative lasers, such as the pulsed dye laser, have been shown to improve dermal collagen. Histopathologic examination of 585-nm pulsed dye laser-treated scars has demonstrated the induction of dermal collagen remodeling [4,5]. Using this concept, Kilmer et al. evaluated the use of a pulsed dye laser in the treatment of rhytids [8]. In a small pilot study, they noted improvement. However, the study results were tempered by the cosmetically unacceptable purpura that is usually seen after treatment with this laser.

Nelson et al. evaluated the subsurface remodeling capacity of a 1,320-nm Nd:YAG laser [9]. The goal of this system, similar to that of the previously described systems, was improvement of rhytids without the creation of a wound. The 1,320-nm wavelength was chosen because of its high scattering coefficient. Two months after treatment, facial rhytids were noted to be improved. No persistent erythema or pigmentary changes were noted. In another study, 35 subjects were treated with three sessions of the 1,320-nm Nd:YAG laser. Small but statistically significant improvement was seen in mild, moderate, and severe rhytids at 12 weeks. However, 24 weeks after the final laser treatment, statistically significant improvement was seen only in the severe rhytid group [10].

Nonablative, or subsurface, remodeling represents the newest approach to improve photodamaged skin. Dermal remodeling is thought to occur through increased collagen I deposition, with collagen reorganization into parallel arrays of compact fibrils. Such an effect might occur with nonablative and ablative laser/light systems. Because the degree of collagen remodeling is not expected to be as great as that seen with other, more destructive, ablative approaches, the nonablative technique is meant for those individuals who do not wish to take time away from their daily activities to laser improve the quality of their sun-damaged skin. The technique is also not meant for those with extensive solar-induced epidermal pigmentary changes. Those individuals are best treated with either an ablative laser or a specific pigmented lesion laser. This study does show that intense pulsed light can improve rhytids. As would be expected, the changes are often more subtle than those seen with ablative techniques. Five subjects showed no clinically apparent improvement. No subjects showed total resolution of rhytids. Nevertheless, nonablative intense pulsed light treatment of rhytids may be a useful modality for the working individual or the postablative laser-treated patient.

More studies are required to determine how long the results will last, what are the most appropriate parameters, and how this technique compares with other nonablative techniques.

REFERENCES

1. Hruza GJ. Laser skin resurfacing. Arch Dermatol 1996; 132:451–455.
2. Goldberg DJ. Er:YAG laser resurfacing: what is its role? Aesthet Surg J 1998;18:255–260.
3. Goldberg DJ, Metzler C. Skin resurfacing utilizing a low-fluence Nd:YAG laser. J Cut Laser Ther 1999;1:23–27.
4. Alster TS. Improvement of erythematous and hypertrophic scars by the 585-nm pulsed dye laser. Ann Plast Surg 1994;32:186–190.
5. Alster TS, Williams CM. Treatment of keloid sternotomy scars with the 585-nm flashlamp-pumped pulsed dye laser. Lancet 1995;345:1198–1200.
6. Teikameyer G, Goldberg D. Skin resurfacing with the Er:YAG laser. Dermatol Surg 1997;23:685–687.
7. Goldberg DJ, Whitworth J. Laser skin resurfacing with the Q-switched Nd:YAG laser. Dermatol Surg 1997;23: 903–907.
8. Kilmer SL, Chotzen VA. Pulse dye laser treatment of rhytids. Lasers Surg Med 1997;19(Suppl 9):194.
9. Nelson JS, Millner TE, Dave D, et al. Clinical study of non-ablative laser treatment of facial rhytides. Lasers Surg Med 1998;17(Suppl 9):150.
10. Kelly KM, Nelson JS, Lask G, et al. Cryogen spray cooling in combination with nonablative laser treatment of facial rhytids. Arch Dermatol 1999;135:691–694.